BIOLOGY 1100

VANCOUVER COMMUNITY COLLEGE

Instructor: Maria Morlin

September 2020 – hybrid course

Lab #4: Energy Acquisition Lab

Outline

- Energy Acquisition lab summary
- Objectives
- Student stations
- Images of specimens
- Resources

Energy acquisition lab summary

- The purpose of the lab was to:
  - identify phytoplankton and zooplankton
  - describe adaptations for feeding and motility
  - categorize organisms to trophic levels

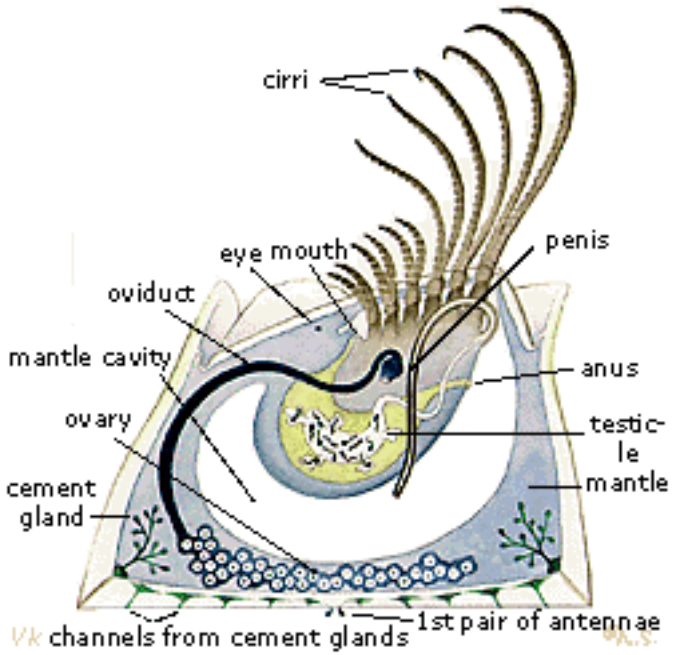
Objectives

1. Define producers in the marine environment.
   - Diatoms, multicellular algae (seaweeds)
2. Define photosynthesis and relation to pigments of algae
3. Define consumers in a food chain, and distinguish between zooplankton, grazers, detritivores, decomposers, filter feeders and predators, using examples from the lab

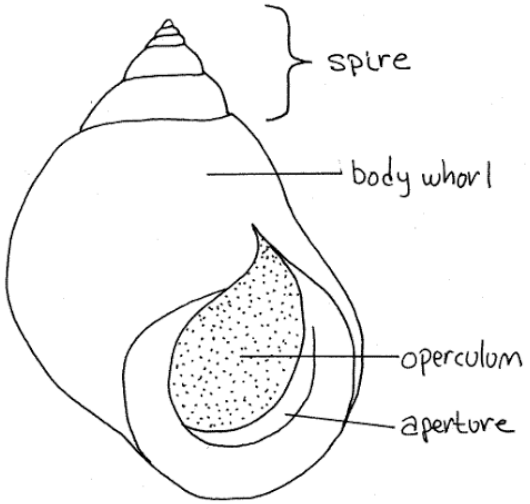
Student stations

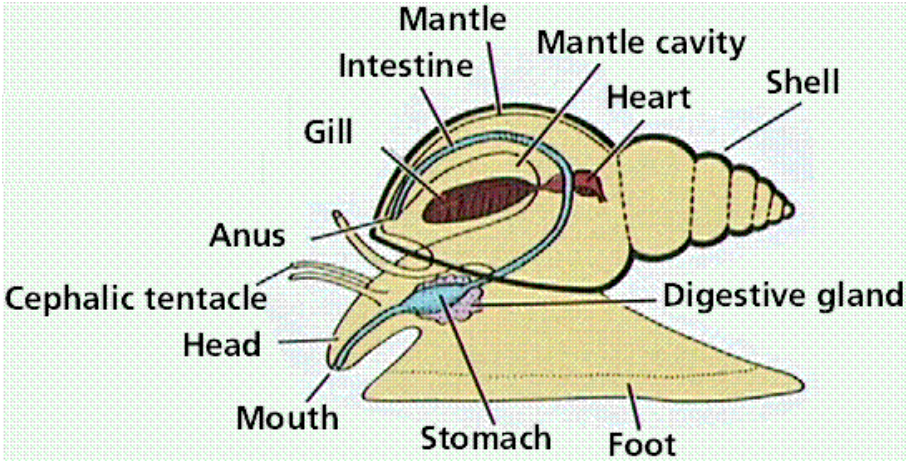
- Each station had:
  - A compound microscope
  - A dissecting microscope
  - A dish with intertidal organisms:
    - Green algae (ulva)
    - Diatoms
    - Dinoflagellates
    - Periwinkles
    - barnacles
  - Separate petri dishes with:
    - Shore crab
    - Copepods
    - Brine shrimp
  - Following are some images and descriptions, and lab posters.

Acorn barnacle



It is sometimes said that barnacles kick their food into their mouths. This is true to a certain extent because they lie on their backs in their calcareous shells, and stick their brush furnished legs (**cirria**) out of the shell to catch food in the water. Their diet can consist of small millimetre large copepods, but even microscopic algae. If the currents are favourable their shell is flushed with new water automatically and the cirria can be used to catch food, otherwise they have to wave with their cirria to pump the water through the shell. It can be fascinating to watch the barnacle as it twists and turns its cirria to obtain the best position when the currents change direction

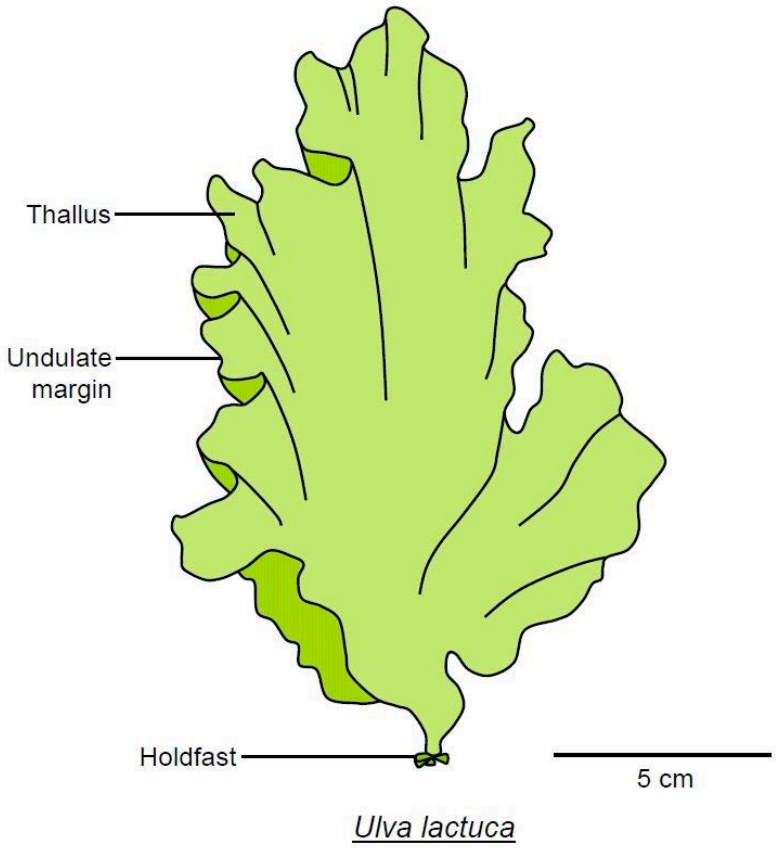




Periwinkle snail

The Common Periwinkle is a small species of sea snail (16-38mm) that originates in the North Atlantic (the coast of northern Spain north to Scandinavia and Russia) but was introduced to North America in 1840 in the Gulf of St. Lawrence (probably with rock ballast) and is now invasive (Benson 2011). It is now found along both the east and west coasts, where it occurs in "intertidal areas, rocky waters to estuarine brackish water and mud flats to 60 m" (Benson 2011). In British Columbia, it has been found in several locations, including Stanley Park and at Acadia Beach and Tower Beach near UBC (Harley 2011).

Ulva (sea lettuce)



Ulva lactuca

Sea lettuce, (genus *Ulva*), genus of green algae (family Ulvaceae) usually found growing on rocky shores of seas and oceans around the world. Some species also grow in brackish water rich in organic matter or sewage and can accumulate heavy metals. Sea lettuce, particularly *Ulva lactuca*, is rich in iodoine and in some vitamins and is used in salads and soups in parts of northern Europe, Japan and China

The thallus, which somewhat resembles a lettuce leaf, is a sheet of cells up to 30 cm (12 inches) long and two cells thick and is embedded in a tough gelatinous sheath. The holdfast, which anchors the alga to its substrate, is disklike. The life cycle consists of alternation of similar spore-producing (diploid) and gamete-producing (haploid) generations. Asexual reproduction is typically by accidental fragmentation.

Station 1: Microscopic Producers: Microalgae

Phytoplankton,
i.e. Diatoms,
Dinoflagellates

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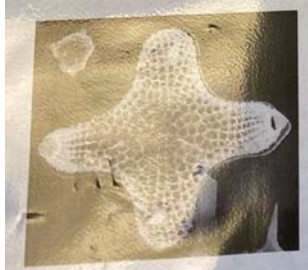
Diatom Examples



Station 2: Macroscopic Producers: Macroalgae

Seaweed, i.e.

Red,
Brown,
Green
Macroalgae

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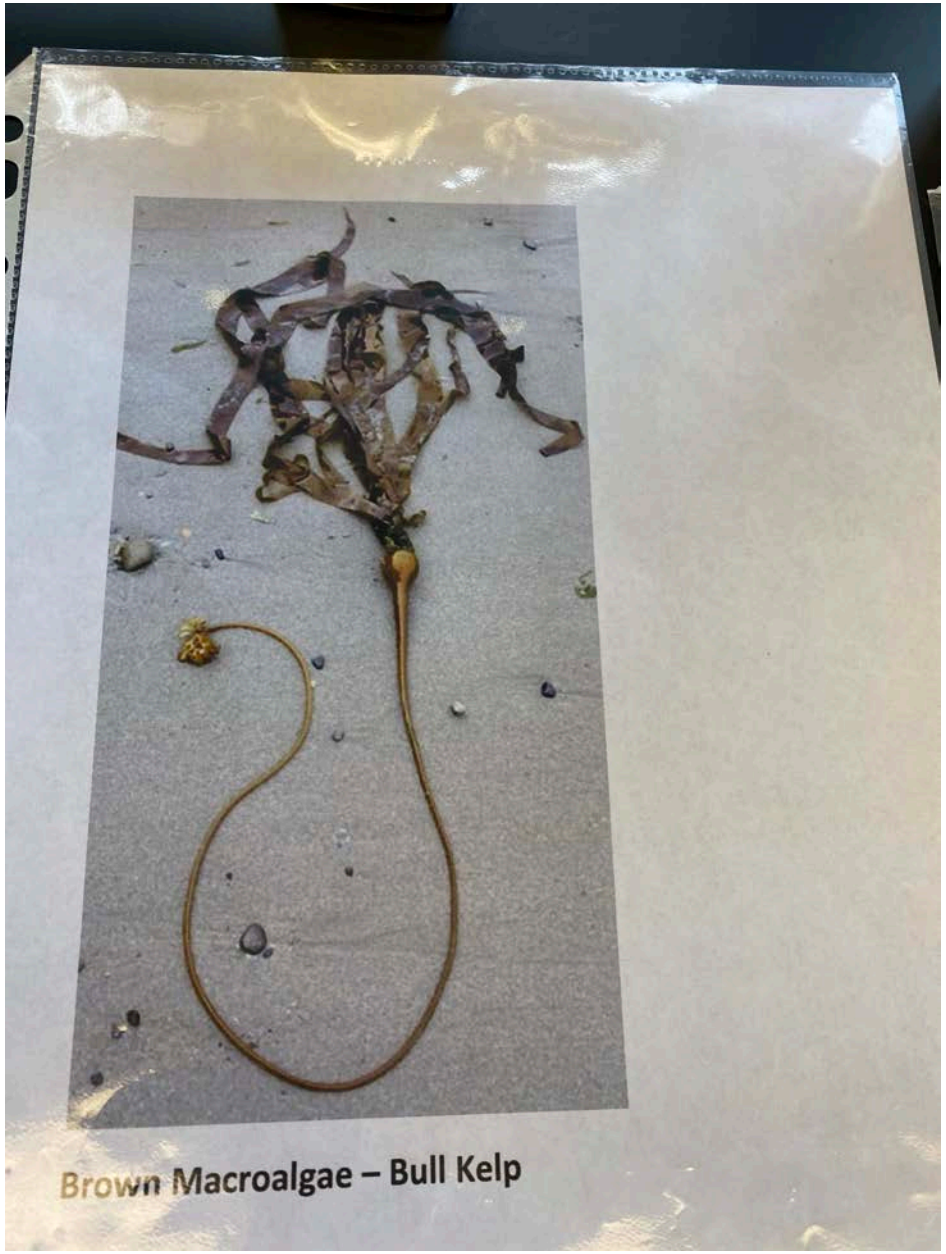
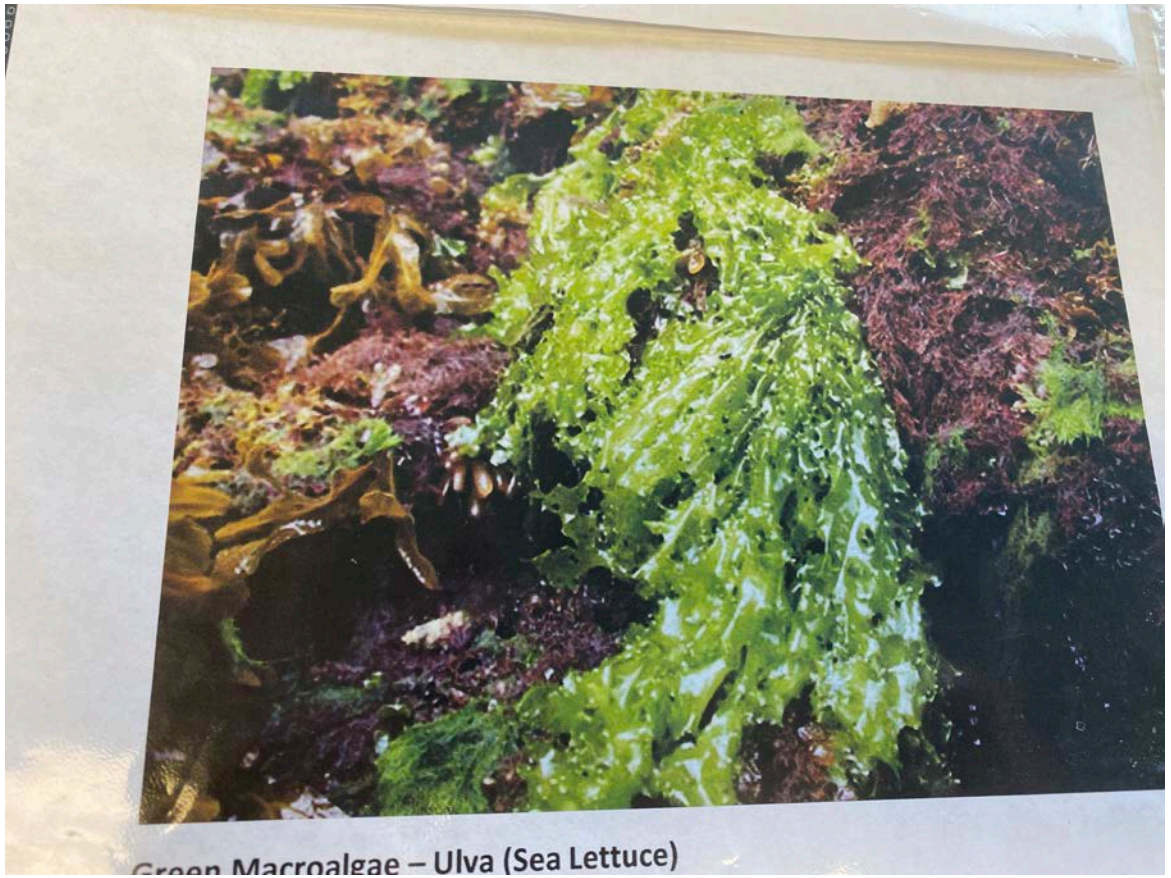
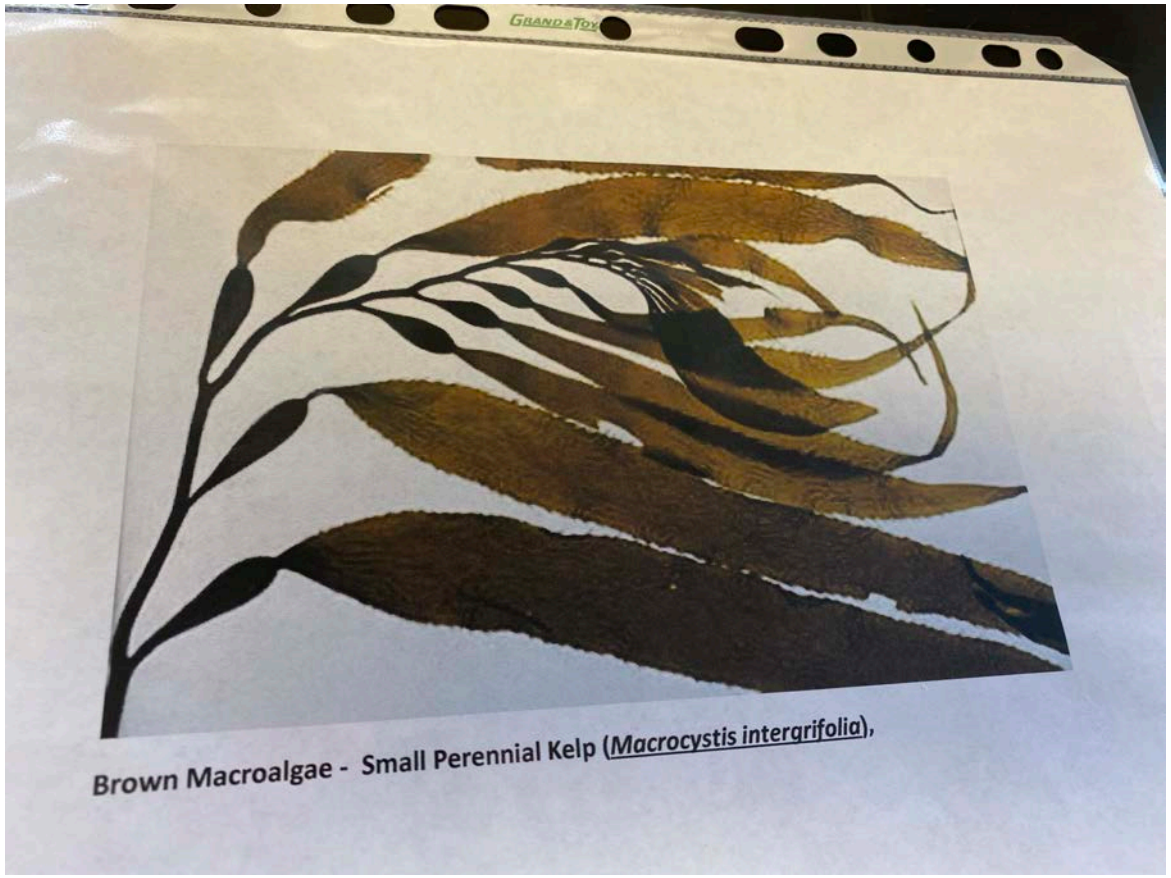


Brown Macroalgae – Bull Kelp

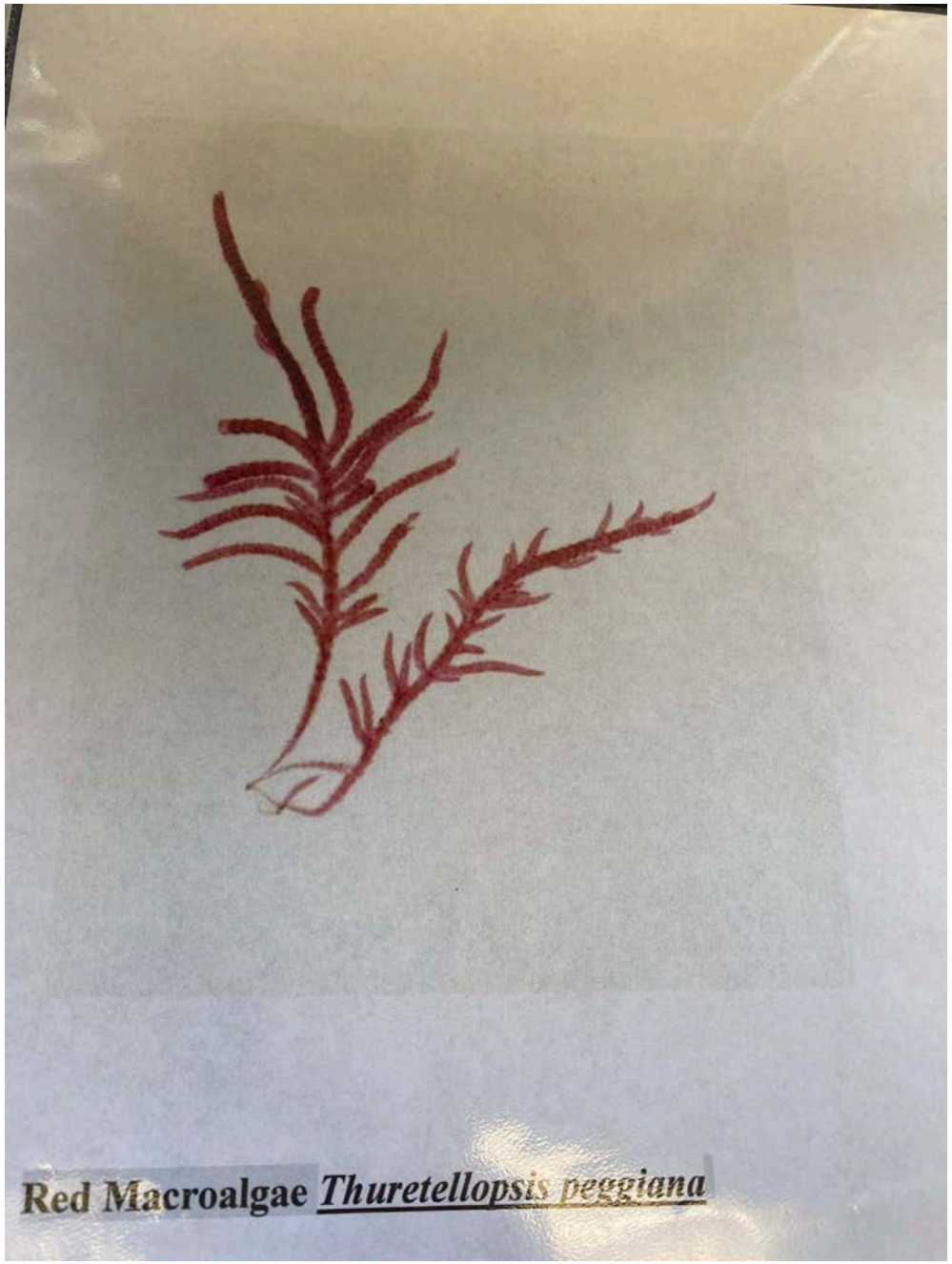


Green Macroalgae – Ulva (Sea Lettuce)

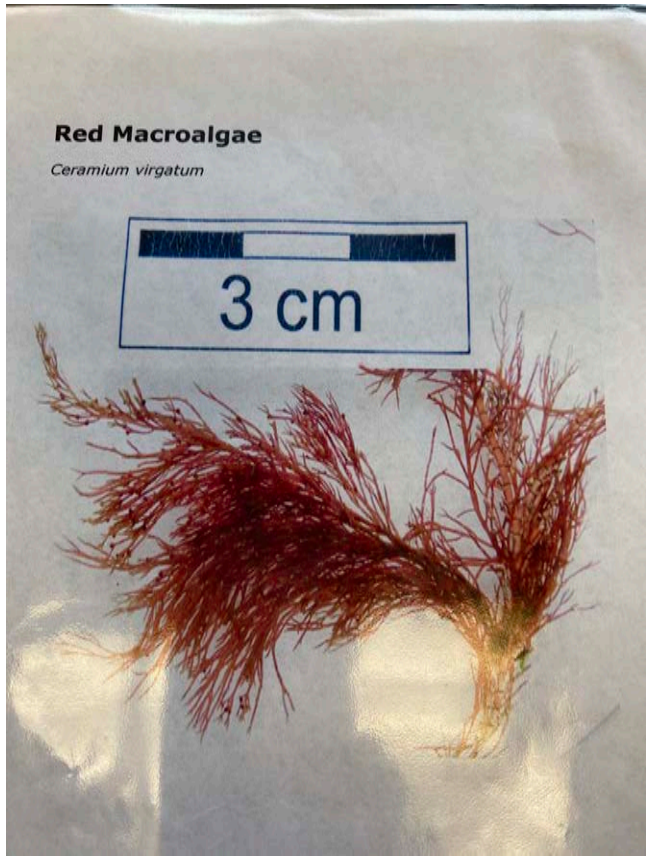


Brown Macroalgae - Small Perennial Kelp (*Macrocystis intergrifolia*),

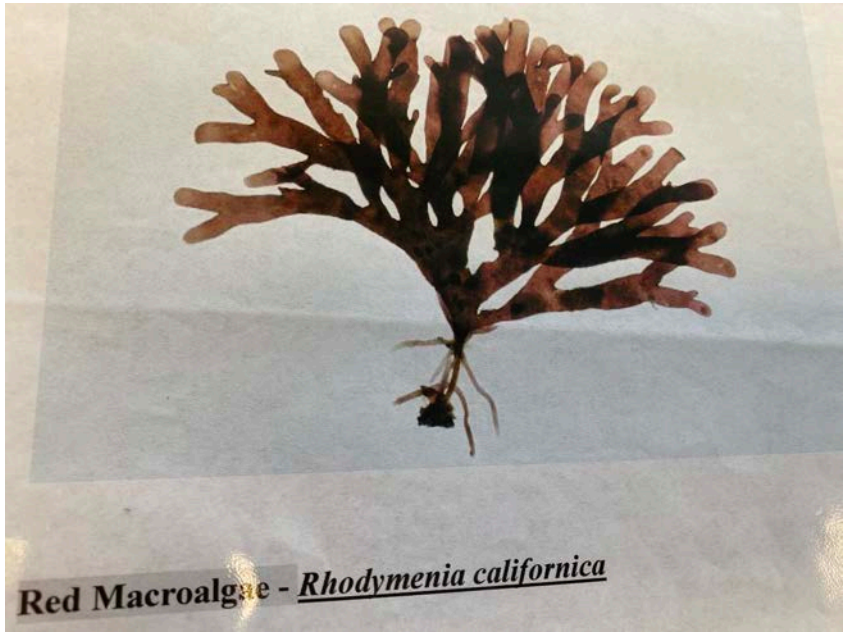
Green Macroalgae - *Acrosiphonia duriuscula*



Red Macroalgae *Thuretellopsis peggiana*

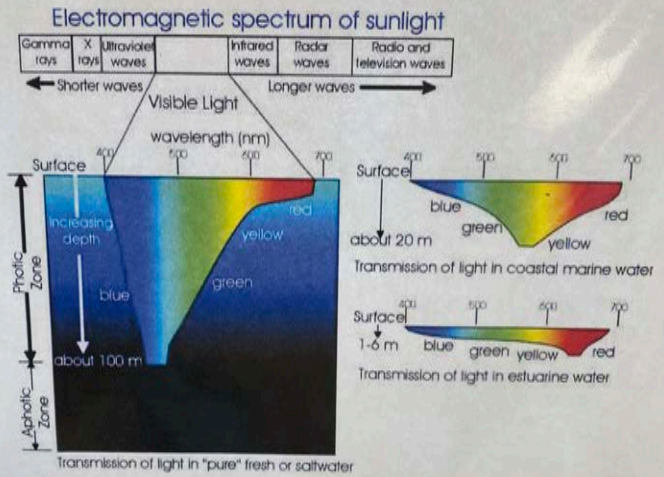

Red Macroalgae
Ceramium virgatum
3 cm


Red Macroalgae – Turkish Washcloth

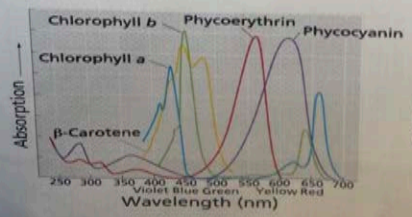

Red Macroalgae - Rhodymenia californica

Macro algae and Light Absorption

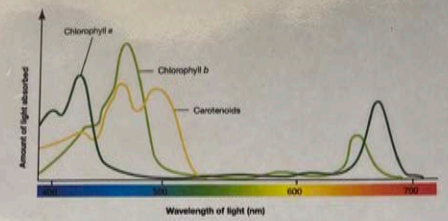
Depth of light penetration through seawater varies with light wavelength:



Chlorophyll and Accessory pigments will absorb certain light wavelengths most optimally:



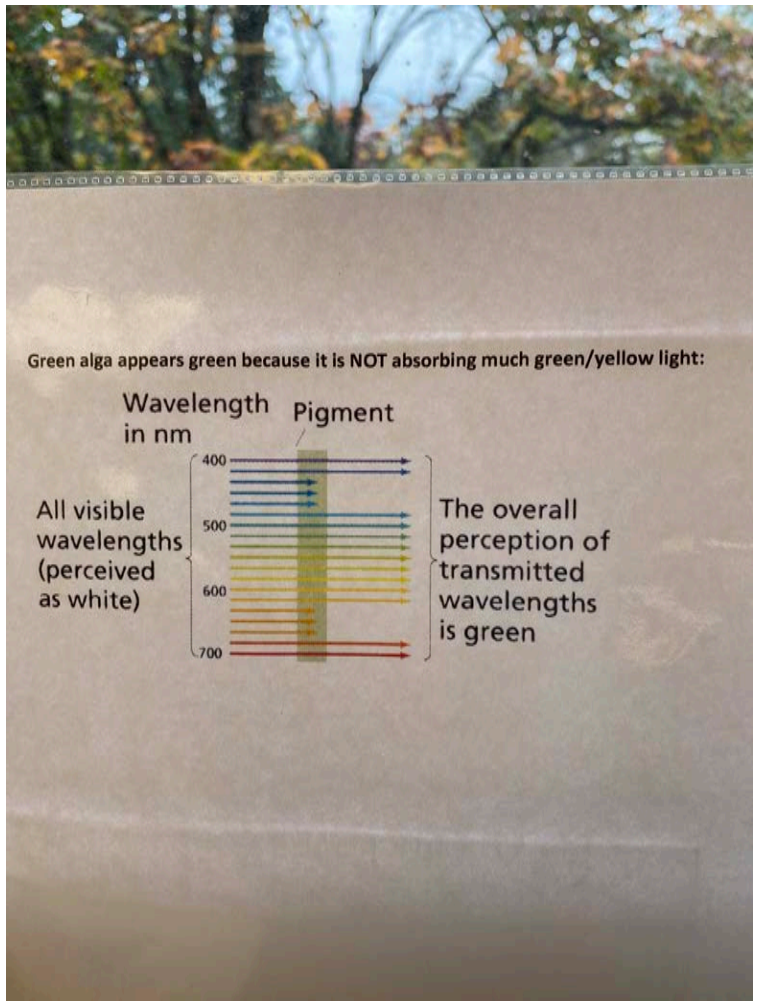
Fucoxanthin, found in brown algae is an accessory pigment not shown on this graph. It absorbs light in the 450 to 540 nm range, peaking at around 510-525 nm



Green Seaweeds (Macroalgae) (Phylum Chlorphyta) usually live in shallow water because the light wavelengths they require the most (blue/red) do not penetrate the water much below a meter.

Red Seaweed (Macroalgae) (Phylum Rhodophyta) contain accessory pigments such as Phycoerythrin which reflect red light (giving these their red hue) and absorb blue light. This is in addition to chlorophyll pigments which also allow absorption of other wavelengths This allows red algae to absorb a wider spectrum of light and therefore at greater depths than green and brown algae.

Brown Seaweed (Macroalgae) (Phylum Phaeophyta) contains accessory pigments such as Fucoxanthin which also allows absorption of a wider spectrum of light than green algae, therefore allowing absorption at greater depths.



Green alga appears green because it is NOT absorbing much green/yellow light:

Station 3: Consumers: Zooplankton

Zooplankton,
i.e.
Artemia,
Tigriopus

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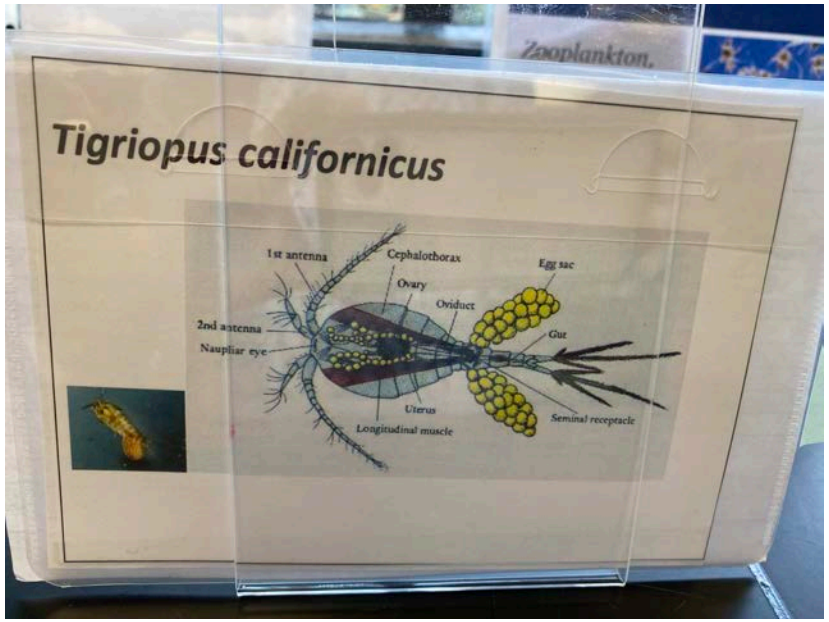

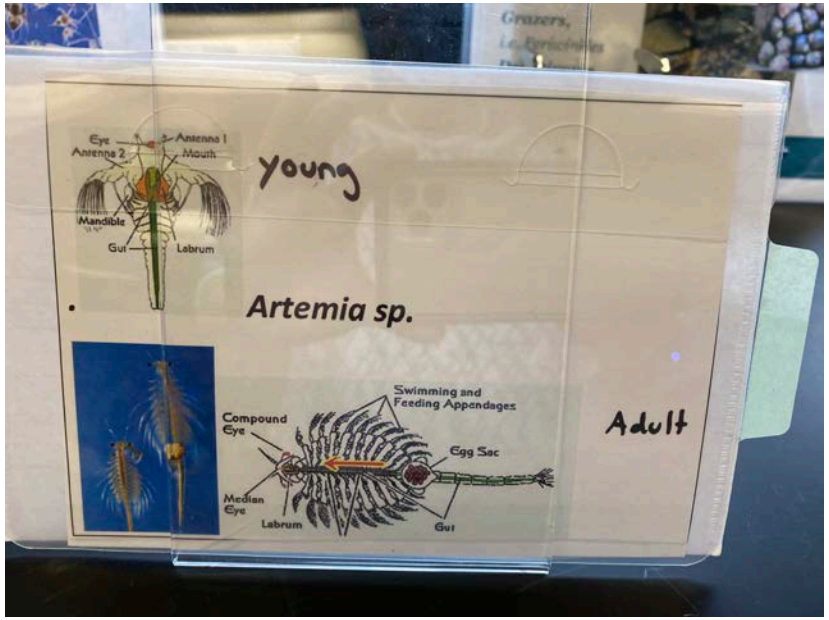

Station 4: Consumers: Grazers, Detritivores, Decomposers

Grazers,

i.e. Periwinkles

Detritivores,

i.e. Shore crabs

Decomposers,

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Station 5:
Consumers: Filter Feeders

i.e.

Blue Mussels

Barnacles

Baleen Whale

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Notes on the lab: please read the energy acquisition lab: pages 35-39

Resources

- The activity guide and the book or lecture slides are the best resources for the lab, both available on the class website.

- For your interest, a Nature of Things episode on the intertidal in British Columbia. https://www.youtube.com/watch?v=070vz8A_IsA&t=408s

- A short clip on acorn barnacles: https://www.youtube.com/watch?v=BOx_BLxKvgs